Standardized Landings Statistics for Pacific Cod *(Gadus macrocephalus)* and Important Shelf Co-Habitants from off Southwest Vancouver Island, and from Queen Charlotte Sound and Hecate Strait, 1956-85.

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STANDARDIZED LANDINGS STATISTICS FOR PACIFIC COD (*Gadus macrocephalus*) AND IMPORTANT SHELF CO-HABITANTS FROM OFF SOUTHWEST VANCOUVER ISLAND, AND FROM QUEEN CHARLOTTE SOUND AND HECATE STRAIT, 1956-85.

by

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ABSTRACT

Foucher, R. P. 1987. Standardized landings statistics for Pacific cod (Gadus macrocephalus) and important shelf co-habitants from off southwest Vancouver Island, and from Queen Charlotte Sound and Hecate Strait, 1956-85. Can. Data Rep. Fish. Aquat. Sci. 620: 81 p.

Landings, effort, and landings per unit effort (LPUE) were calculated for Pacific cod in each area plus lingcod and petrale sole off southwest Vancouver Island, lingcod and rock sole in Queen Charlotte Sound, and Dover sole, English sole and rock sole in Hecate Strait. The effort is refined by the Option-2 method of allocating effort in a multi-species fishery and standardized using revised relative fishing power factors to account for changing vessel efficiency. This report replaces and updates to 1985 an earlier paper.

Key words: Landing statistics, Pacific cod, Hecate Strait, Queen Charlotte Sound, southwest Vancouver Island

RESUME

Foucher, R. P. 1987. Standardized landings statistics for Pacific cod (Gadus macrocephalus) and important shelf co-habitants from off southwest Vancouver Island, and from Queen Charlotte Sound and Hecate Strait, 1956-85. Can. Data Rep. Fish. Aquat. Sci. 620: 81 p.

On a calculé les débarquements, l'effort et les débarquements par unité d'effort pour la morue du Pacifique capturée dans chaque zone; de plus, on a effectué les mêmes calculs pour la morue-lingue et la plie de Californie peuplant les eaux au large du sud-ouest de l'Île de Vancouver, la morue-lingue et la sole du Pacifique du bassin Reine-Charlotte et la sole, la sole anglaise et al sole du Pacifique du détroit d'Hécate. La précision de l'effort est améliorée à l'aide de la méthode Option-2 qui alloue l'effort dans une pêche polyspécifique; de plus, l'effort est normalisé à l'aide de facteurs révisés de la capacité relative de pêche afin de tenir compte de la variation de l'efficacité d'un navire. Le présent rapport remplace un document précédent et le met à jour jusqu'en 1985.

Mots-clés: statistiques sur les débarquements, morue du Pacifique, détroit d'Hécate, bassin Reine-Charlotte, sud-ouest de l'Île de Vancouver

INTRODUCTION

Landings, effort and landings per unit effort (LPUE) were calculated for Pacific cod and its various co-habitants in major offshore regions in an earlier paper (Foucher 1984). These data were refined by using the Option-2 method (Westreim 1983) and standardized to correct for changing vessel efficiency. However, since its publication the description of the derivation of relative fishing power factors was revised and published (Westrheim and Foucher 1985). During the review process some procedural changes were made which resulted in a change to the relative fishing power factors. It has also been possible to add three years to the time series. The purpose of this paper, therefore, is to replace the earlier report (Foucher 1984) with revised and updated statistics.

The report includes the standardized landing statistics for Pacific cod and its important shelf co-habitants--lingcod (Ophiodon elongatus) and petrale sole (Eopsetta jordani) off southwest Vancouver Island; lingcod and rock sole (Lepidopsetta bilineata) in Queen Charlotte Sound; and rock sole, Dover sole (Microstomas pacificus) and English sole (Parophyrs vetulus) in Hecate Strait. Data for Dover sole was not included in Foucher (1984).

Major Area 4B (Straits of Georgia and Juan de Fuca) is not included as it is dealt with in another paper (Westrheim and Foucher, In review) which presents an assessment of Pacific cod stocks in this region.

METHODS

Within each major region Canada-U.S. landings, effort and LPUE were estimated for Pacific cod and its major shelf co-habitants from each important fishing locality (ground) or larger area. The grounds included from off southwest Vancouver Island are Amphitrite Bank, Big Bank, Clo-oose, Deep Big Bank, Minor Statistical area 24 (MSA 24) and Swiftsure Bank (Fig. 2). Deep Big Bank, not shown in Figure 2, lies due west of Big Bank. Data from areas 3D, 5A and 5B (Fig. 1) were not divided into individual grounds. Data from area 3D was not included in Foucher 1984. The grounds included from Hecate Strait are: Dundas, Two Peaks, Butterworth, White Rocks-Bonilla, Shell, Ole Spot, Horseshoe and Reef Island-Cumshewa (Fig. 3). Effort was calculated using the Option-2 method of Westrheim (1983) but with two differences.

First, for major areas 3C, 3D, 5A and 5B, selected species (Pacific cod and its major shelf co-habitants) landings and effort were substituted for all-species landings and effort. This eliminated landings and effort of slope species whose depth distribution did not significantly overlap with that of shelf species. Furthermore, the slope area was trawled primarily by U.S. vessels before the 1980s.

Second, for major area 3C, the Canadian total landings of selected species (Pacific cod, lingcod and petrale sole) were estimated for Clo-oose Ground and then subtracted from the Canada-U.S. landings of each species in Area 3C. This was done because Clo-oose Ground lies within the Canadian 3-mile limit and was therefore closed to U.S. vessels. The resulting Canada-U.S. selected-species landings for Area 3C were then used to extrapolate the Canadian interviewed landings for each species and ground. A further exception was that petrale sole was deleted from the selected species for January-March because mature specimens had migrated down the continental slope to spawn.

For each quarter year the Canada-U.S. total landings by ground were calculated by extrapolating Canadian interviewed landings for that ground by the Canada-U.S. total landings over the Canadian interviewed landings for the appropriate major area. In the cases of Areas 3D, 5A and 5B this was unnecessary as these areas were not treated by ground.

In some quarter years, if there were no Canadian interviewed landings in a locality for a species but there were Canada-U.S. landings (not coded to locality), the Canada-U.S. landings by locality could not be estimated and are indicated as being unknown (UNK) in the tables showing landings by quarter year.

In the tables of annual landings, landings are summed over the quarter years. In cases where landings are not known for one or more quarter years the sum is still reported for the quarter years with known landings and is thus a minimum estimate. For example, for Amphitrite in 1957 (Table 1) the minimum estimate is:

UNK + 896 + 74 + 0 = 970, with these numbers coming from Table 4.

After March 31, 1981 there was no fishing by U.S. vessels in Canadian waters. It should therefore be understood that for tables labelled as Canada-U.S. there are no U.S. landings after this date.

Effort was standardized by multiplying the nominal effort for each landing by a correction factor determined by the horsepower class of the vessel involved. The derivation of these factors is described in Westrheim and Foucher (1985).

In this derivation, data prior to 1960 was excluded because of the low demand for Pacific cod among Canadian processors, uncorrectable encoding errors in landing records and the predominance of single-gear trawlers (Westrheim and Foucher 1985). No correction was made for the difference in efficiency between single-gear and double-gear trawlers because few single-gear vessels were operating after 1960. Data prior to 1960 is included here and was standardized by horsepower class but should not be considered entirely reliable.

RESULTS

Following is an index, for each major statistical area and species, of the table numbers for tables of annual landings and appendix tables of statistics by quarter year for selected grounds.

Area	Pacific cod	Lingcod	Dover sole	English sole	Petrale sole	Rock sole
Annual landings - tables						
3C	1	2	-	-	3	-
3D	4	4	-	-	4	-
5A	5	5	-	-	-	5
5B	6	6	-	-	-	6
5C	7	-	8	9	-	10
5D	11	-	12	13	-	14
Statistics by quarter-year - appendix tables						
3C	1-6	7-12	-	-	13-18	-
3D	19	20	-	-	21	-
5A	22	23	-	-	-	24
5B	25	26	-	-	-	27
5C	28-30	-	31	32-34	-	35-37
5D	38-42	-	43-47	48-52	-	53-57

In the tables of landing statistics by quarter-year for Areas 5A and 5B (Appendix tables 22-27) there are quarter years with no effort indicated but substantial landings (e.g. Appendix table 22, 1956, Q4: landings = 295 t, effort = 0 h). This is caused by the lack of Canadian interviewed landings. In these cases effort and LPUE could not be estimated because U.S. data does not include effort.

In the tables of statistics by quarter-year there are cases with small landings but no effort (e.g. Appendix table 3, 1957 Q3: landings = 2 t, effort = 0 h). This is caused by the lack of Canadian interviewed landings of more than 0.5 t in any single depth interval. Rank-1 and rank-2 depth intervals could not be chosen (Westrheim 1983) and no effort was assigned.

ACKNOWLEDGMENTS

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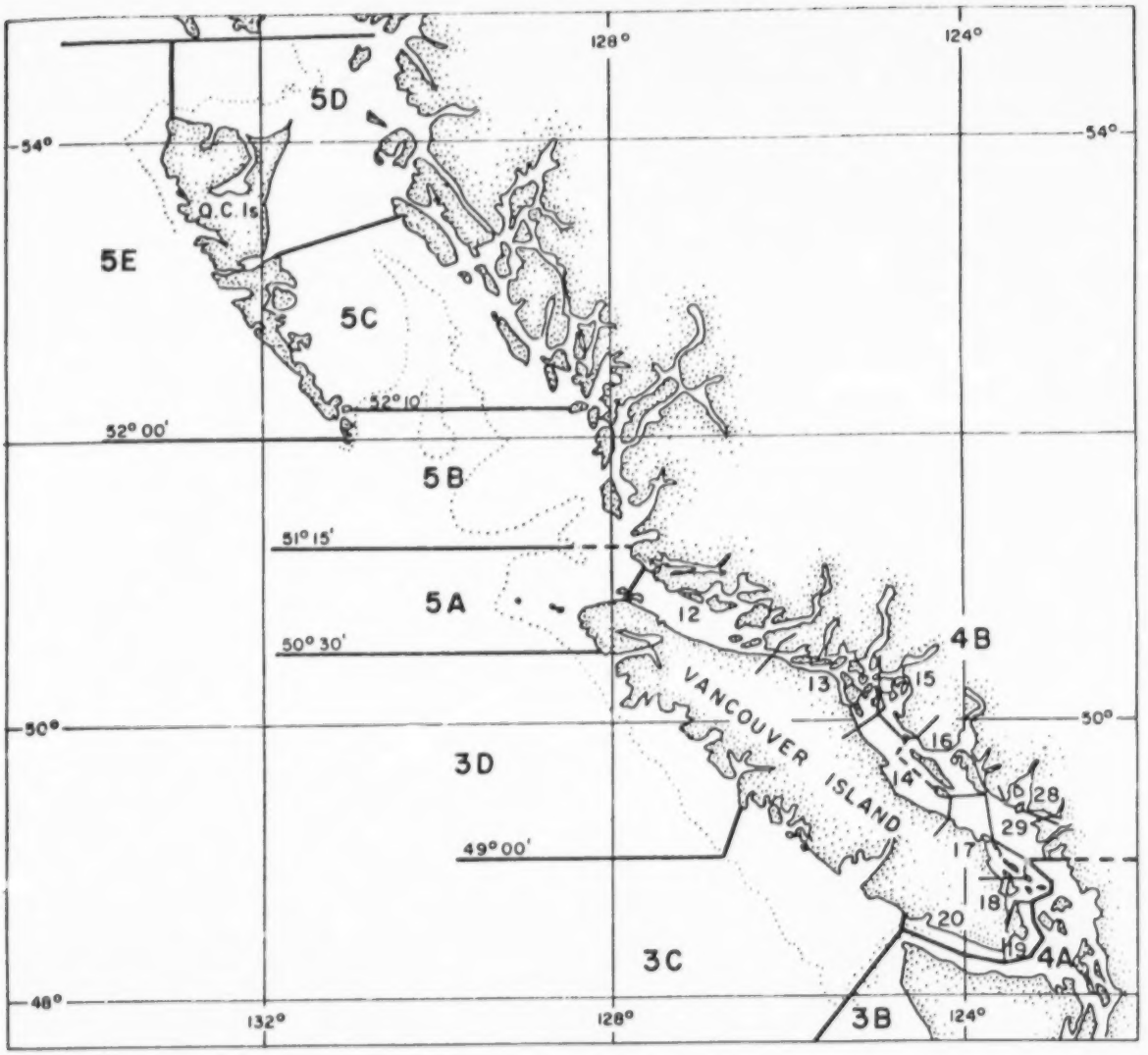

Fig. 1. Major statistical areas for Canada-U.S. trawl landings of groundfish.

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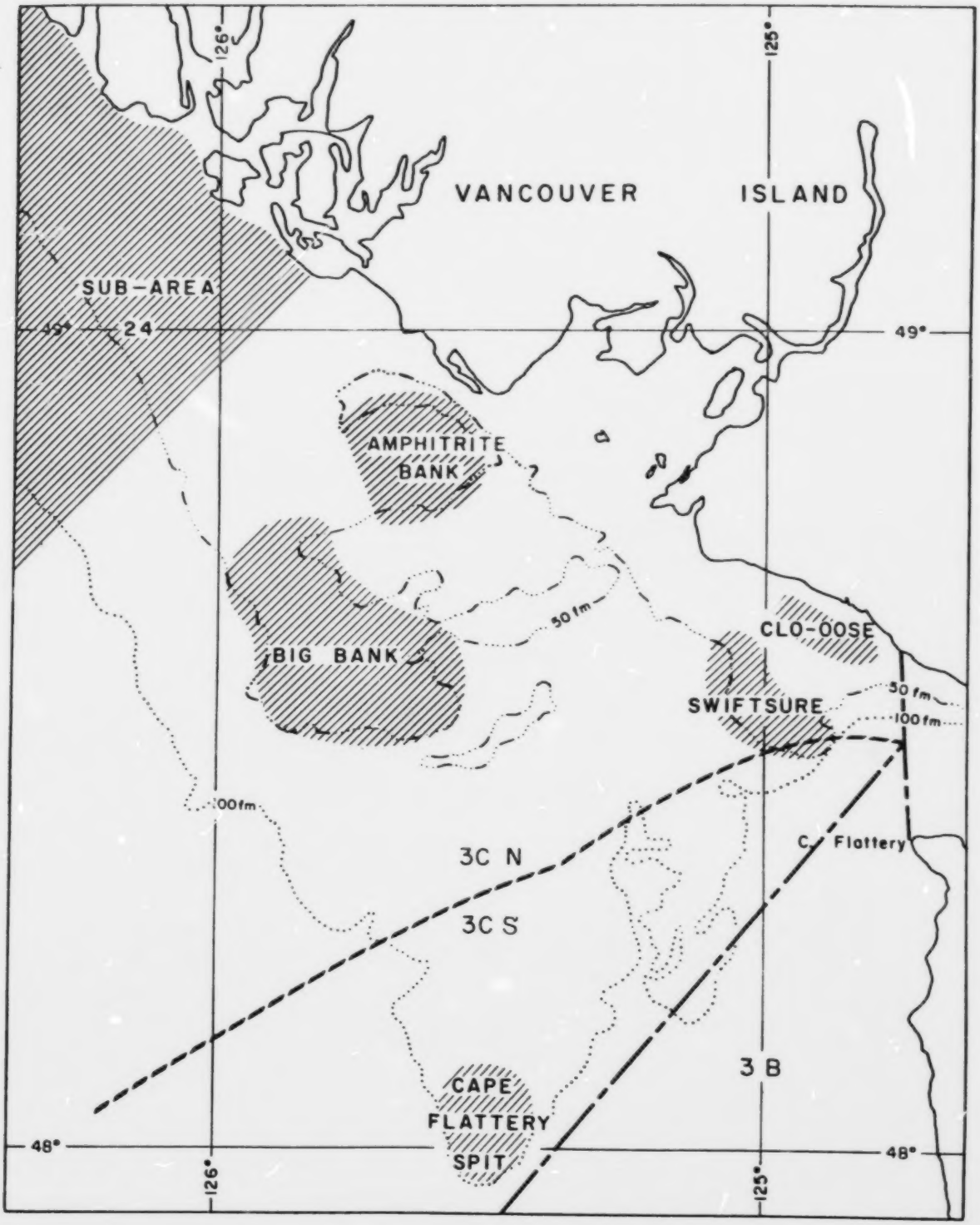

Fig. 2. Major trawling grounds off southwest Vancouver Island.

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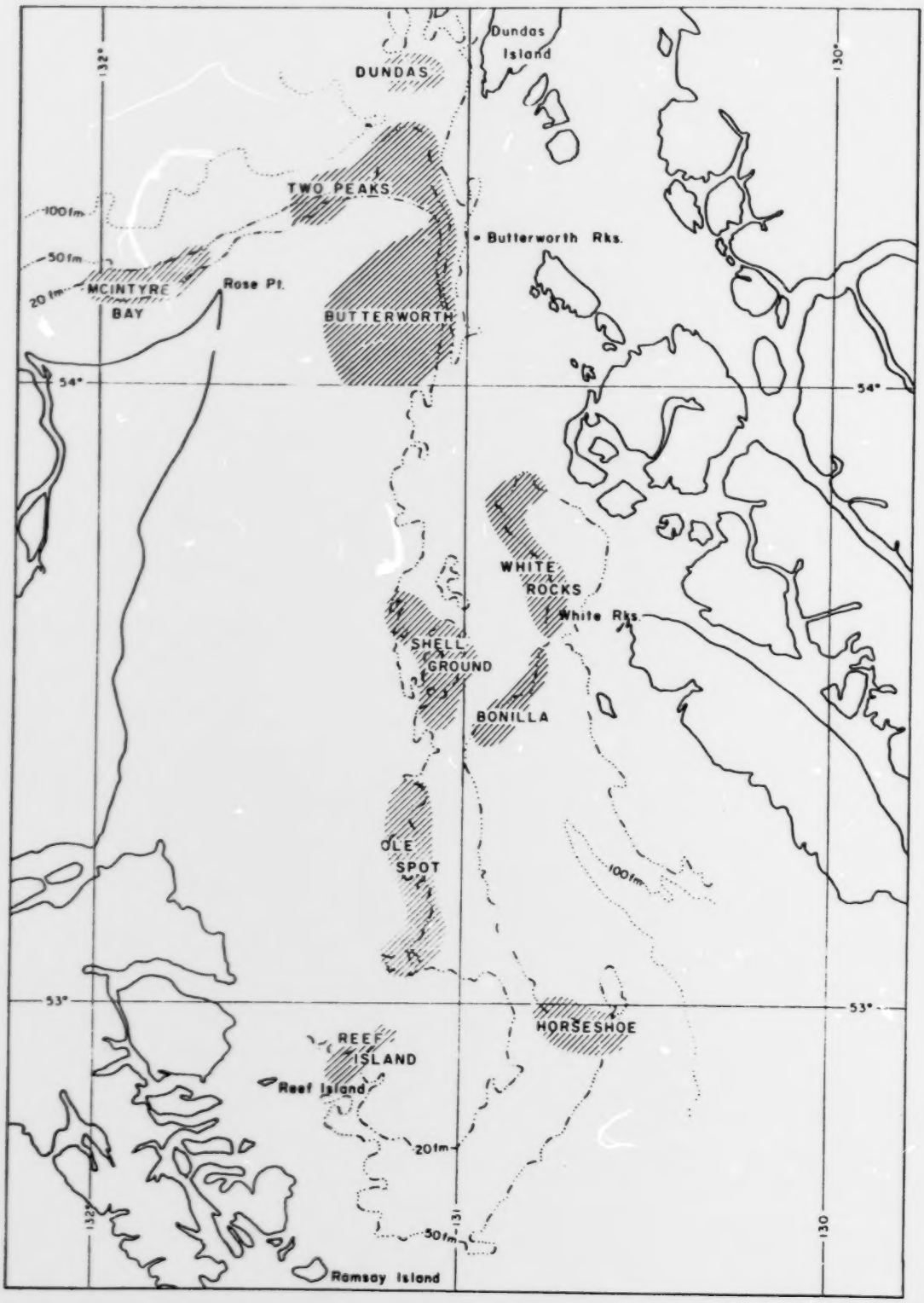

Fig. 3. Major trawling grounds in Hecate Strait.